

# The Development of Teachers' Sustainable Competency on 21st-Based Human Resources in Ensuring School Readiness for Higher Level on PISA (Program for International Students Assessments)

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**Abstract:** The purpose of this research is to review the literature regarding (1) the design of sustainable competency development in the 21st century for teachers, (2) sustainable competency subconstruct design from the perspective of tactical operation, (3) sustainable competency subconstruct design from the perspective strategic operation, (4) construct school readiness in the educational process. The exclusion carried out by this article is reviewed in terms of abstract and research results. Literature Research is limited to empirical articles or research for ten years (2012-2022), and the main book of a theory is not subject to limitations. Two hundred sixty-nine articles were collected, and the inclusion and exclusion criteria were implemented, totaling 84 articles. The results of this study are (1) the design of sustainable competency development consists of two main constructs, namely tactical dan strategic operation, (2) constructs of school readiness obtained by researchers include literacy knowledge and skills, science knowledge and skills, approaches to learning, (3) sustainable competence is considered capable of increasing school readiness in carrying out the educational process following the 4.0 era, and (4) through the development of sustainable competence the PISA ranking can be restored in stages.

**Keywords:** Sustainable Competence, Teachers, School Readiness, PISA

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## Introduction

PISA (Program for International Students Assessments) is part of the OECD in analyzing the performance of 15-year-old students in 3 main areas: science, mathematics, and literacy (Volante et al., 2017). Since 2000 PISA has provided opportunities for all countries to evaluate student learning achievements at the age of 15 as a reflection of developments in the world of education (OECD, 2019). Historically, in the early 2000s, Indonesia was ranked 39th to 41st, then over time, Indonesia also has not experienced significant changes in the mapping of the quality of education from the PISA perspective.

The causal causes of such PISA results in a country are influenced by several factors, namely (1) curriculum, (2) educational facilities and infrastructure, and (3) the competence of teaching staff as the main factor (Govorova et al., 2020). In today's era of the industrial revolution 4.0, digitalization in technology takes on some aspects of human life activities. The opinion of the authors is in line with the opinion of the expert that the era of the industrial revolution was part of an era of disruption with collaboration with technology, resulting in patterns of life in which most of the processes were assisted or taken over by the role of technology (Wrahatnolo & Munoto, 2018). The 4.0 industrial revolution affected various institutions, such as health, politics, government, economics, and even educational institutions, which were also influenced by the 4.0 era. Rationally, in terms of process, implementation, and evaluation in various fields, technology has been utilized for work efficiency. The education sector is also the same; regarding management, leadership, and supervision, it is appropriate to use technology as an intermediary for implementing these activities so that the desired goals can be achieved effectively and efficiently. Chiu further (2021) explains that when it comes to the educational process, technology should only be used to help, not to dominate the process. This is explained in this way because the role of technology cannot completely replace the essence of education; an educator remains the main actor. The era of the industrial revolution 4.0 is where the achievement targets that each individual must achieve are 4C skills, namely creativity, communication, collaboration, and critical thinking (Supena et al., 2021). The era of the industrial revolution 4.0 is a time of disruption and globalization merging into one (Mourtzis et al., 2018). education and the development of the times in the era of the industrial revolution 4.0 are related because, in simple terms, education is defined as a map or direction pointer from a country to develop human resource competence in education (Triwiyanto, 2014).

In the 4.0 era, individuals must have several skills, such as communication, collaboration, problem-solving, and critical thinking (Wardhani et al., 2021). The various abilities mentioned by the compiler are broad generalizations about the extensive abilities a teacher must have to create outcome nature of education link and match with the demands of the times. As educators, in actualizing their various competencies, teachers tend not to meet the optimal word. This is evidenced by the results of the UKG (Teacher Competency Test), which states that the average ability of teachers in Indonesia is 65 out of the minimum standard of 75. Other research also proves that the adaptability of teachers in implementing new learning models is appropriate to project-based learning in the implementation of the 4.0 era curriculum is quite low; the results of the study prove that the

Teacher's ability to adapt to the new curriculum and policies is in category (1) very good 5,7%, (2) good 21,9%, (3) fair 37,6%, (4) poor 27,1%, and (5) very poor 5%. The initial data presentation has proven a gap between the new paradigm, policy and curriculum concepts and the educators' readiness (Saputra & Nuchron, 2019). This research proves that the competence possessed by teachers is still not optimal at the level of forming students who are ready for the times, where one of the indicators is the achievement of optimal levels in PISA. The competence of teachers who are not yet optimal correlates to school readiness, especially in terms of (1) science knowledge and skills, (2) approaches to learning, and (3) literacy knowledge and skills (Tremaine, 2017). The researcher focuses on these three constructs because the theory directly relates to the Teacher. Departing from this idea, the gap in the form of a disruptive change in educational direction and the low level of teacher readiness, whenever there is a change in educating students towards an optimal PISA ranking is interesting to examine through the Development of Sustainable Competency in the 21st Based Human Resources to Teacher in Ensuring School Readiness for Higher Level on PISA (Program for International Students assessments), the assumptions of contemporary researchers can change, but if the Teacher has sustainable competence or sustainable Competency then adaptability and capability to respond to disruption will become easier to actualize.

## Method

The research approach in this study is a systematic literature review from articles on teacher competency development and various studies on PISA, as well as factual data regarding competency achievements that teachers have achieved. The article inclusion criteria as a guideline for this SLR discusses (1) teacher competence, (2) development of 21st-century teacher competence, (3) sustainable competency development, (4) school readiness or school readiness in carrying out integrated educational processes, (5) human resource management, (6) school organizational culture, (7) school climate, and (8) a study of the determinants of factors and antecedents in the PISA ranking. The exclusion carried out by this article is reviewed in terms of abstract and research results. Literature Research is limited to empirical articles or research for ten years (2012-2022), and the main book of a theory is not subject to limitations. Mapping of the database used by researchers is science direct, Eric, and Sage publication. Articles that met the inclusion criteria were compiled and studied systematically.

The preparation of this article uses the identification of how (1) portraits of teacher achievements in carrying out their competencies, (2) the design of sustainable competency 21st on Teacher, (3) the impact of sustainable competency development on school readiness, and (4) the impact of continuous teacher competency development on achievement PISA ranking. The study in this article, through the steps by Harris (2019), covers (1) identification, (2) screening, (3) eligibility, and (4) inclusion so that the research results will be objectively crystallized. Related to this, the researchers produced 84 articles that passed to be used as references and reviewed based on the author's name, year of publication, method, research results, and research objectives.

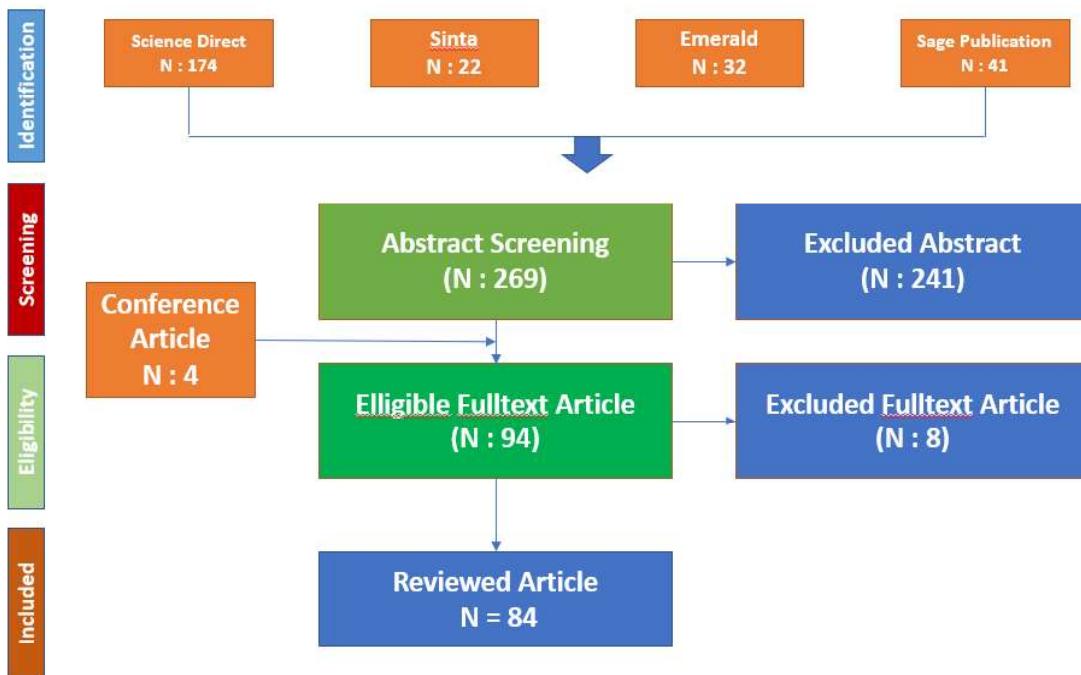


Figure 1. The Research Steps (D. Harris, 2019)

## Results

Based on the collection of articles, 269 articles align with the design objectives of this SLR research by following the current search criteria as stated in the methodology. Of the 269 articles that the researchers successfully screened, 84 articles were collected that entered and passed the criteria which discuss the key constructs in the title of this study, namely (1) sustainable competence, (2) teacher competence, (3) school readiness, and (4) studies on PISA for literacy, numeracy, and Science skills. The 84 articles will be used as extraction material to be compiled in the article manuscript as listed in the writing of this scientific work.

### The Development of Sustainable Competency 21st on Teachers

In this case, the main object is the Teacher because education in the current era leads to disruption. After all, it is in harmony with the times in the digitalization era. This phenomenon can occur this way because education is a tool to prepare students as raw input becomes output and reaches outcomes following the development of the times (Triwiyanto, 2017). Disruptive development of the times causes instrumental input and environmental input in education changes with the development of the times, such as policies, curriculum, the competence of educators and education, and dynamic educational facilities (Shahroom & Hussin, 2018). Curriculum change will affect other components such as funding, educational facilities and infrastructure, teacher expertise, principal expertise, and academic staff because the curriculum is one part of the educational process road map

that is the main indicator of achieving educational outcomes (Ferguson-Patrick et al., 2018). The problems in the current era refer to educational disruption, which leads to the unpreparedness of each academic unit to carry out new policies and achievement targets-output students in an educational institution (Pokhrel & Chhetri, 2021). The portrait of this problem according to the researcher's point of view, the portrait of this problem was created due to the lack of readiness of human resources because the construct of educational human resource development has not yet led to the formation of sustainable capabilities. Sustainable capability development means the high reliability of HR capabilities in the long term. Compiler opinion, if any Sustainable Competency based human resources management on teachers for educators is implemented, high disruption will not affect readiness to deal with continuous change. The authors' opinion is supported by Saboowala et al. (2021) if an institution can develop sustainable competencies, then no matter how hard the changes, the level of adaptation human resources in the education unit will be able to deal with it. The authors assume that if teachers face the dynamics of change with sustainable competency development, readiness to achieve goals will be more optimal because the principal, a leader, will be easy to contextualize old changes with new changes.

The construct of sustainable development referred to by the compiler consists of (1) motivational affirmation, (2) personal skills, (3) organization knowledge, (4) performance management, (5) competency management, (6) learning management system, (7) competency data, (8) organization strategy and development plans.



Figure 2. The 21st Century Sustainable Skills Development Construct

The main concept that can be studied from the visualization framework is related to sustainable competence, which is based on actual operation as a foundation for carrying out repetitive activities in educational institutions carried out daily by teachers as their professional duties. Respect to strategic operation is a competency that must be possessed to carry out tasks that are not repetitive every day but need to be carried out

routinely every month, semester, or once every year, which function is for the development of the Institute. The rationale of the compiler to implement (1) motivational affirmation, (2) personal skills, and (3) organizational knowledge as the lowest foundation is an expert's statement which emphasizes that the ability to know organizational characteristics and individual independence as personal skills in completing assignments is a basic competence of teachers in Finland so that independence does not interfere with other teachers' assignments but still has group cohesiveness (Tapani & Salonen, 2019).

The expert's idea can be interpreted as teacher competence in Finland, where teachers are required to have various individual skills or personal skills and knowledge about the characteristics of the Institute so that the process of carrying out the profession is in line with the vision and mission of the institution, and can focus on other teachers to complete their respective responsibilities while maintaining teamwork. The construct of motivational affirmation is a tactic that must be implemented as the main ability of the principal and an extensional ability for teachers. This is based on the theory of motivation from Herzberg (1966), where affirmation of motivation is a manifestation of appreciating all forms of responsibility and work from subordinates through the provision of wages, health insurance, and verbal and non-verbal praise. The principal must carry this out as a form of affirmation for a teacher. In another concept, this is said to be part of transactional leadership, so the results that can be obtained are positive affirmations from members because they feel valued (Baskoro, 2022). So the conclusion of the skills teachers and principals must possess giving subordinates affirmation so they are always motivated to provide more optimal performance in various tasks. At the level above, there are (1) performance management systems, (2) competency management, and (3) learning management assessments. Development of teacher competence in the form performance management system is represented through the Teacher's ability to objectively evaluate himself, colleagues, and institutions through a scientific basis based on data (Kaur et al., 2018). Researchers project that if the Teacher can implicate such a competency, then efficiency monitoring will emerge because accuracy will appear in these activities due to objectivity and scientific foundations.

In the construct, next to it, there is competency management, defined as a teacher who has competence in carrying out management functions in each of their main duties (Ismail et al., 2018). When examined theoretically, this is one of the derivatives of ability instructional leadership because it contains means management engineer. In other countries, such as Serbia, management skills are necessary for teachers to carry out planning and monitoring functions in every school activity (Simonović, 2021). Another construct learning management assessment is the Teacher's ability to utilize digital-based learning media and carry out evaluations of the implementation of learning the management system (Beer & Mulder, 2020). Last, in terms of its nature, the strategic operation is a competency that regulates the organization's strategy until competency data whose function is to manage strategy based on the management of objective numerical data or statistics for decision-making and Teacher implementation as a supporting factor for strategic management in educational institutions. This is based on research by Thao et al. (2022), which states that optimal teacher competency development in Vietnam implies strategic management skills and the ability to manage school decision-making data for teachers to assist school principals in a participatory manner. The researcher provides ideas if any competency data and

skills in strategic organizational management will direct a teacher to sustainable competence, which can help develop schools in a participatory rather than passive manner. Therefore, in the following discussion, the researcher will discuss in detail the concept of tactical operation and strategic operation.

### Sustainable Competency-based Tactical Operation

Tactical operation is a concept where the actualization of 21st-century skills is attached to tactical or conceptual and practical activities combined (LeChasseur et al., 2020). The first thing to be the concept of tactical operation is a competency that must be implemented as the main ability of the principal and an extensional ability for teachers. This is based on the theory of motivation from Herzberg (1966), where affirmation of motivation is a manifestation of appreciating all forms of responsibility and work from subordinates through the provision of wages, health insurance, and verbal and non-verbal praise. The principal must carry this out as a form of affirmation for a teacher. In another concept, this is said to be part of transactional leadership, so the results that can be obtained are positive affirmations from members because they feel valued (Baskoro, 2022). For teachers, this must be implemented for students so that students enjoy when carrying out learning because it is given reinforcement in the form of a reward. So the conclusion of the skills teachers and principals must possess giving subordinates affirmation so they are always motivated to provide more optimal performance in various tasks. Such a concept is also provided by non-formal education. Suppose a tutor and mentor in training have their main competence in providing enthusiasm for participants, namely through affirmation and praise. In that case, this is carried out solely not to praise but to foster a high motivational passion. Optimum to achieve stage or the next stage in the form of training because motivation is the main capital in learning. If an individual has the motivation, then the main fuel for enthusiasm in understanding a material will be able to be achieved by an individual (Nyanjom, 2020).

On the other hand, motivational affirmations can be used by the Teacher as a curative action when students violate something, then at another time, the student has improved his attitude, as a form of improving self-discipline (Binning et al., 2019; Schutte et al., 2017; Smith et al., 2021). Wu et al. (2021) explained in more detail that when it comes to giving affirmations to a student, being able to increase student self-confidence and self-efficacy so that they are projected to be able to develop their abilities to obtain achievements according to their fields. It is based on various studies in both formal and non-formal education, and researchers view motivational affirmation must be internalized in teachers' design of sustainable competency development. On tactical operation from the chart, above from motivational affirmation is personal skills. Personal skills consist of several sub-constructs related to 4C skills (Creativity, Communication, Collaboration, Critical Thinking). This is supported by expert research, which states that in the 21st century, for continuous competence, a teacher is required to have 4C skills because students are required, and so does the Teacher because learning initiators must master them first before providing learning that produces 4C outputs (Kim et al., 2019; Mistareehi, 2020).

Teacher creativity is represented through its ability to combine learning methods and classroom management, communication is represented through teaching that is easily understood by the entire class population,

collaboration is represented through the Teacher's skills to coordinate with parents and teacher colleagues in constructing student learning development, and critical thinking is represented through problem-solving on contextual problems in class (Bhayangkara et al., 2020; A. Harris & Jones, 2019; Zilka et al., 2022). In the third case, organizational knowledge is in the bottom chart construct. Knowledge of the organization is a part that covers how an individual can understand (1) work climate, (2) patterns of coordination and communication and (3) ethics and organizational values (Monroe et al., 2019). Rational researchers include these competencies used to prevent conflicts that may arise in an institution or organization. This is reinforced by Monroe et al. (2019) if the ability to understand institutions in terms of culture and communication patterns, as well as ethics, can be used as a guide for an individual to be able to work in a comfortable environment because you are not comfortable it is difficult to complete your professional duties. Researchers understand this as a guide or reference for teachers to avoid non-productive conflicts so that they can work comfortably without any conflict pressure from other individuals or groups within the institution. Organizational knowledge plays a central role because when conflicts arise and cause work discomfort, self-efficacy and motivation to complete their professional duties are also low (Da'as & Zibenberg, 2021).

The next construct lies in the competence performance management system, which addresses the ability to coordinate and implement a holistic system for the performance of each member or division in the institution (Schleicher et al., 2018). Suppose this is taken to imply a teacher. In that case, a teacher must be competent to measure a student's ability in the context of cognitive, affective and psychomotor development, both in formative and summative forms. The expert stated that it is not only in manufacturing institutions that require human resources to understand performance management and control, but in educational institutions, it can be implicated through individual student journals, which include cognitive, affective, and psychomotor development through formative and summative assessments (Gbollie & Keamu, 2017). The essence of the construct performance management system is the placement of the Teacher's function through his competence to closely supervise students regarding their individual development so that there is no lag in student control and self-development.

Details of this are attached in (1) summative assessment by the Teacher, (2) formative assessment by the Teacher, (3) teacher's class journal on student development, and (4) data collection on student self-development and interests (Gbollie & Keamu, 2017). The next construct is competency management, which directs teachers to have capabilities in (1) management functions, (2) time management, and (3) ensuring quality school-based management. This is reinforced by several studies which explain that if the management competence of a teacher is actualized through the ability to carry out planning to supervision for the school management process, then it is also required for a teacher to be able to determine priority scales by prioritizing students in time management and being able to carry out the function as the second person who runs quality assurance in school management (Bostancı et al., 2020; Díez et al., 2020; Sahito et al., 2016). The researcher agrees with the expert's idea because if all management tasks are delegated to the school principal, there will be performance inconsistencies for the school and education system. After all, the school principal, as an academic staff needs to delegate a certain task to achieve goals by optimizing existing human resources. , not charged to one man on

every job. Learning management assessment is another construct that can be described as part of the final construct in tactical operations.

Learning management assessment is part of the learning management system, but more narrowed down to the part of the Teacher's competence, the reason for handling the learning management system. Academic staff in charge of information systems and technology have been implemented in schools. The assumptions of researchers and teachers serve as individuals who can carry out (1) content delivery, (2) collaborative feedback in UI and UX with the LMS planner, and (3) course collaboration. The researcher's opinion aligns with the expert's opinion, which states that the Teacher's role in LMS is to assess, provide input, and implement flowchart dari LMS (Kabassi et al., 2016). The meaning of discontent delivery is the Teacher's capability in channelling material in the school's LMS. Collaborative feedback is input with the basis of a teacher who understands the concept of user interface and user experience in a learning application and course collaboration which leads to efficient use of LMS characterized by cooperative learning with students in information systems (Bradley, 2020; Hentati et al., 2021; Moon et al., 2022; Raymond et al., 2016; Wiratomo & Mulyatna, 2020).

### **Sustainable competency based Strategic Operation**

Strategic operation is a concept in 21st-century competencies and skills that discusses strategic capabilities that teachers and principals can implement as the main actors in the field of education. This is supported by previous researchers who stated that tactical managerial skills must be supported by conceptual skills that can implement back up against a variety of tactical skills so problem-solving in tactical problems can be encountered (Demir et al., 2019). This section consists of two main constructs, namely (1) organization strategy and development plans and (2) competency data. Organization strategy and development plans is a competency that answers how individuals can design link and match vision and mission, strategies for continuous quality improvement, and setting individual skills in applying strategic management to condition an optimal work climate (Ertem et al., 2021; Fauzi et al., 2021; Kala & Tee, 2016; Sonia, 2021). This terminological understanding directs the axioms of researcher thinking to the sub-constructs of part point 1 consisting of related competencies (1) link and matches learning to industries through world growth, (2) continuous improvement on the learning process, (3) and applying strategic management and climate at school. In sustainable competency development, education is directed not to go off track for continuous improvement, at least in the learning construct (Lavigne, 2020).

In the last construct in the discussion in this article, especially in sustainable competency development, there are competencies or capabilities about competency data. Competency data is the ability to use statistical data, objective numerical data, and scientific research methods for decision-making in the management process (Ghasemaghaei et al., 2018). Research from information systems science can be used as a basis for application in sustainable competency development because teachers need to be able to implement this in their contribution to decision-making. Based on this theory, the sub-constructs of competency data are (1) applying statistical and graphical techniques data and (2) research and evaluation methods. Researchers place these two competencies as strategic operations because the theoretical concepts in this section have the scope and the intensity of activities

within a certain time frame regularly, but not repetitive or become daily activities. Therefore, it is said to be a strategic competence.

### School Readiness in Achievement Levels in PISA

School readiness is addressed by existing sustainable competency in achieving the PISA ranking. The construct of school readiness consists of many theories. Here school readiness will be displayed by the researcher in Figure 3.

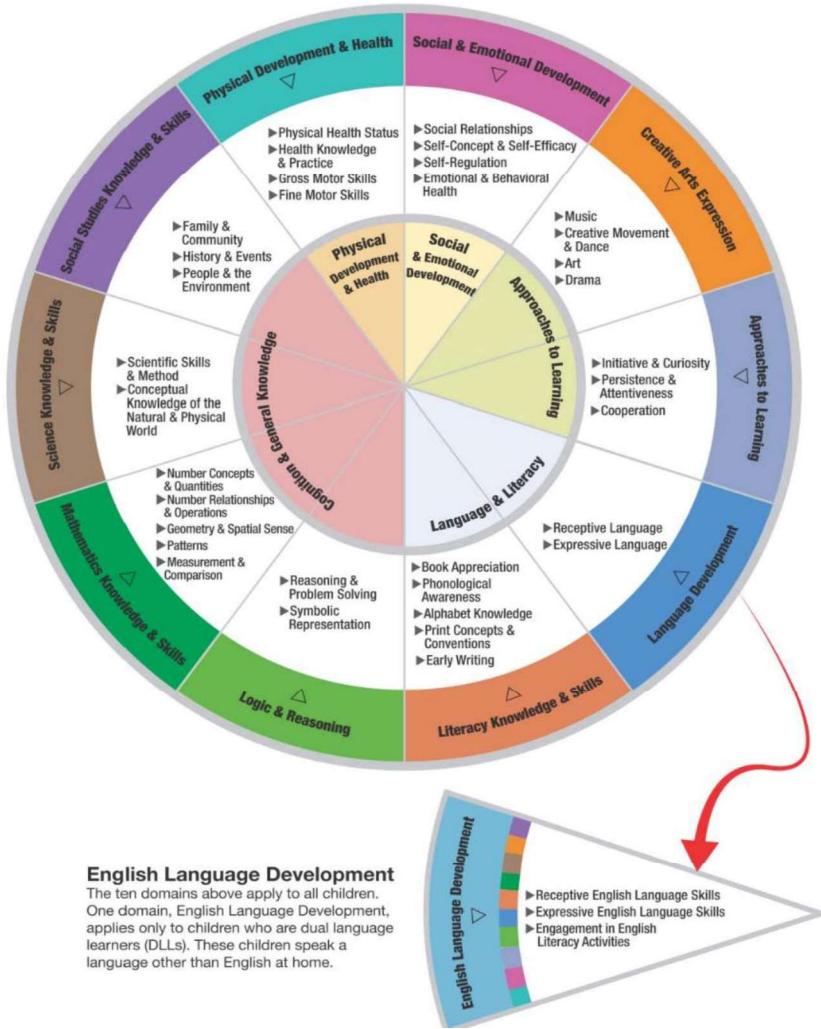


Figure 3. Deep Construct School Readiness

Source:(Tremaine, 2017)

In this concept, school readiness in the actualization of sustainable competencies, researchers will be directed to several deep constructs of school readiness, namely (1) science knowledge and skills, (2) approaches to learning, and (3) literacy knowledge and skills. The constructs linked by the compiler do not cover all the indicators contained in school readiness because, in this study, the authors focus on the implications of

sustainable competence, which are related to the three indicators mentioned in the previous description. Science and knowledge skills are the Teacher's ability to implicate knowledge and naturalization in the learning context (Hartman & Morris, 2019; Tremaine, 2017). Approaches to learning are part of persistence, the development of teacher learning models according to curriculum developments, and initiatives on learning innovation. Lastly are literacy and knowledge skills, which include (1) early writing, (2) book appreciation, and (3) phonological awareness. The reason the authors stipulate that these three things are included in the research indicators is that a theory that has a causal relationship to the PISA ranking indicator is numeracy, literacy, and skills in science, Ministry of Education and Culture, which fulfills the link and match on the three indicators chosen by the compiler to examine school readiness or school readiness in the implications of continuing competence which are new and revolutionary.

## Discussion

### **Impact of Sustainable Competency Development on School Readiness**

Science and knowledge skills from school readiness projected by researchers will increase due to continuous competency development. This is because the construct related to science and knowledge skills is continuous improvement in the learning process. It is said so because it relates to continuous improvement in the learning process and contains a steps plan, do check and act where this has implications for how a teacher can analyze where his teaching deficiencies are so that the PDCA process will be created self-learning. Previous researchers also supported this in the early 2000s. They stated that teachers who were aware of competency to continuous improvement independent learning would arise, through non-official training, reading professional development books, or carrying out independent learning through colleagues (Dinkelman, 2003). This old research still has strong relevance if, in the current era, researchers argue that various independent learning processes from teachers can be carried out through hybrid training, participating in seminars and workshops, and teachers can improve the process-teaching and learn through various platforms and social media. The researcher's opinion is in line with the expert's opinion, which states that the development of teacher knowledge in the current era can be carried out anywhere, anytime, and at a minimum cost if someone can take advantage of social media and scientific facilities that exist on internet networks (Ansari & Khan, 2020; Greenhow et al., 2020; Ibrahim, 2016). On the inner construct, science and knowledge skills be found in scientific skills and methods (Tremaine, 2017). This can be realized through competency data, which is a competence for teachers in continuously applying statistical, graphical, and research evaluation methods. Therefore, regarding science and knowledge easy for continuous competency development to create output in the form of teachers who can carry out research within the scope of the school and make scientific, objective and accountable decisions.

The second point approaches to learning, or approach to learning. Conceptually, in terms of personal competence skills, critical thinking and creativity will be a reference for researchers. Critical thinking has a major role in overcoming class problems through problem-solving efficiently, and creativity will take a role in preparing teacher-creative learning that refers to conduciveness in learning (Kasmaienezhadfar et al., 2015).

The researcher assumes the Teacher's creativity as a stimulus for creating a dynamic learning approach. Dynamic in this idea is not stagnant in the classical learning process. Expert confirms approaches to learning are not only implicated in creating learning. However, willingness to study teaching and learning with their friends is also a sub-indicator (Tremaine, 2017). These sub-indicators can be realized through continuous competence with personal skills and collaboration. Collaboration is the competence of a teacher to be able to coordinate with colleagues, principals, parents, and students to develop aspects that are lacking in their learning because, in the educational context, students are said to be core external customers who are the main customers of the educational process (Sallis, 2014). Another construct in approaches to learning can also be created by persistence and attentiveness through competency management, namely in the sub-construct-assure quality. Quality assurance in learning is intended and directed in the form of certainty of quality presentation and consistency of delivery of quality learning in the long term (Saeed & Saeed, 2018).

The last point is related to literacy knowledge and skills, which is represented in (1) early writing, (2) phonological awareness and (3) book appreciation. The three achievements of these abilities can be accessed or resolved through competence and personal skills in terms of communication. Communication in continuous competence describes a teacher who can explain material easily and relates to phonological awareness. Phonological awareness is an ability to organize language appropriately so that teachers' various communications and authorship in text form become easier to understand but still have scientific weight (Welcome & Meza, 2019). Departing from this, it can be concluded that phonological awareness in a study and school readiness can be created through personal competence skills in continuous competency development. Book appreciation is the Teacher's readiness in literacy by completing their reading, not just reading but not writing the book as a reference in their work, as well as maintaining the literacy materials they have (Tremaine, 2017). Researchers confirm this book appreciation will be represented through competency actualization work ethics and values because one ethics literacy for educators is to refer to books that have been read and store books or reading materials in the right place so that they can be used between generations (Campbell et al., 2020). Such characteristics are competencies not discussed in high quantity by researchers in competency development. Last, regarding early writing, of course, it has been represented. It can be achieved if a teacher has competent data or skills in methods and management of research results as a basic competency for writing scientific papers (Arifin et al., 2020). Based on these various things, it can be concluded that the development of sustainable competency impacts school readiness because every existing sub-competence or sub-construct is always related to the basic theory of school readiness to implement the educational process.

### **Impact of Continuing Competency Development for PISA Ratings**

The description and discussion regarding the impact of continuous competency development on the PISA ranking by researchers will be connected through the antecedents and determinants of factors that influence a country's ranking. The antecedents in the ranking assessment for PISA are (1) numeracy, (2) science or natural knowledge, and (3) literacy (Hopfenbeck et al., 2018). The researchers' assumptions in this discussion regarding the antecedents of the factors that exist unsustainable competency related and have causality in the construct

tactical operations. It can happen that way because numeration is in tactical operations listed in competence numerical knowledge, which is the Teacher's capability to understand basic mathematics and applied mathematics in school management and learning (Hawes et al., 2020). This, if narrowed down, has a close relationship with a numerical assessment concept, where what is a supporting aspect in achieving optimal numeracy when measuring PISA is the ability of teachers, both Mathematics and non-Mathematics teachers, in terms of basic and applied numerical, because teachers have low numerical competence. It will not be easy to collaborate social and mathematical learning in one space correlated curriculum when the basic competencies in mathematical terms are not fulfilled (Hwa, 2018).

On other factors, when discussed, the antecedent factors in the form of science or natural knowledge can be affirmed and recognized by competence and creativity where deep personal skills In this aspect, an aspect that is thoroughly discussed is regarding the Teacher's capability in connecting one subject to another subject through an experience of inquiry in nature or a setting in which students spend time outside of school, this is referred to as project-based learning (Schutte et al., 2017). Finally, the third antecedent factor is literacy, which is deep tactical operations. This can be realized through competence and personal skills in creativity, which examines the capabilities of teachers in building literacy and naturalist skills of students. If associated with the construction of school readiness, which can be achieved through sustainable competency, the literacy assessment problem can be overcome with literacy and knowledge skills, especially deep phonological awareness and book appreciation. This can be achieved because teachers are ready and able to have grammatical awareness. The output that will be achieved is imitating the behaviour of students who speak with coherent, weighty, and always grammatical grammar. When communicating, reasoning at each closing statement (Wrahatnolo & Munoto, 2018). The second is ebook appreciation. If a teacher has competence in book appreciation, then a culture of reading books, reviewing books, and archiving books in the right way as a form of appreciation, as well as a culture of literacy, students will get used to it. The outcome that will emerge regarding this matter, a student will understand the basic concepts in literacy practice directly in everyday conditions.



Figure 4. Linkage of PISA Antecedent Factors and Tactical Operations in Sustainable Competency

The second discussion is the determinant factors related to achievement ranking PISA with strategic operation in sustainable competency. It should be noted that the determinant factors that determine the achievement ranking PISA are (1) school culture, (2) quality assurance in school management, and (3) decision-making ability and, (4) action research implemented by the school (Susongko & Afrizal, 2018). Sustainable competency compiled

by the researcher clearly illustrates the relationship between the four determinants of these factors. First, school culture and quality assurance in school management directly relate to organizational strategy and development plans. It can be generalized this way because, in the existing sub-designs, the construct contains a link and match between learning and industries, continuous improvement on the learning process, and strategic management and climate conditioning. Second, decision-making ability and action research have a connection with competency data. Competency data have sub-designs that apply statistics and graphical techniques to make decisions and research and evaluations model. As mentioned in the article in the results, these various sub-designs can allegedly provide sustainable competency development, which can raise Indonesia's ranking in PISA. This is also in line with research conducted by previous researchers in other countries, in which to achieve an optimal PISA for a country, the competence of teaching staff is needed, which is in line with the assessment aspects of (1) numeracy, (2) literacy, and (3) science, as well as being able to overcome institutional problems such as school culture and incompetent human resources to carry out their roles as educators (Hopfenbeck et al., 2018).



Figure 5. Linkage of PISA Antecedent Factors and Tactical Operations in Sustainable Competency

## Conclusion

Through the development of sustainable competency 21st, several sustainable competencies are studied, which means disruptive changes will not fade them. The assumption is that all competencies may develop, but not all sustainable Competencies. Allocation exists in sustainable competency. This is the achievement of teacher competence link and matches with PISA and global developments, as well as to create high teacher adaptability in managing learning in an era of disruption. Sustainable competency development has two main constructs, tactical operations and strategic operations. Based on the available display, the antecedent factor is related to competence in tactical operations by teachers and strategic operations is related to the determinants of level achievement factors in PISA.

## Recommendations

For readers, this article should be used as a reference for insights regarding teacher sustainable competence. Researchers should be able to research this theme in depth through qualitative research and quantitative design to examine the influence of each construct accurately and in-depth.

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